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INTERNSHIP PROPOSAL - Fixed-term contract

Ammonia-Hydrogen Reactive LES of a Gas Turbine Burner

Reference: CFD-2023-VAR-01
Team: CFD
Research unit: Energetics and propulsion
Salary: 7,8 K€/year (gross)
Duration: 6 months - **Starting date**: Feb 2024

Location: 42 avenue Gaspard Coriolis – 31057 Toulouse
Contact person: Laurent Gicquel
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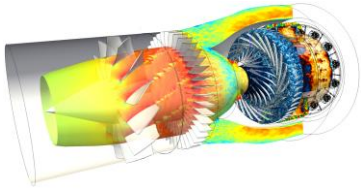
laera@cerfacs.fr
Level of education required: Bachelor of science

HOST LABORATORY

The **Cerfacs** is a fundamental and applied research center specializing in modelling and digital simulation. Through its resources and expertise in high-performance computing, it addresses major scientific and technical problems in public and industrial research. The Cerfacs teams develop innovative methods and software solutions to meet the needs of the aeronautics, space, climate, energy and environment sectors. Cerfacs works in close interaction with its seven associates: **Airbus**, **Cnes**, **EDF**, **Météo France**, **Onera**, **Safran** and **TotalEnergies**.

HOSTING TEAM

The CFD (Computational Fluid Dynamics) team is the largest team at CERFACS. It focuses on the simulation of flows by developing advanced numerical methods and applying them to aircraft, rockets, helicopters, car engines, turbines, etc. This team develops essential tools in many application fields with a well-known leitmotiv in industry today: let's calculate systems (aircraft, engines, etc.) before building them.



JOB DESCRIPTION

Topic(s): Combustion High Performance Computing

Context: Gas turbines play an essential role in the energy production chain which is a major source of GHG. In view of the urgent environmental situation, carbon-free fuels such as hydrogen and ammonia represent a significant opportunity to decarbonize power generation. One of the main challenges is to succesfully transition to these new fuel blends while controlling the formation of pollutants (NOx) and limiting modifications to the existing turbines. The design and optimization of both traditional and innovative burner technologies heavily rely on numerical simulations. In this context, the performance of turbulent combustion models, which has been thoroughly validated for traditional fuels, needs special care for decarbonized combustion where multi-fuel multi-injection unconventional burner configurations are the norm.

Mission:
The objective of the mission is to acquire a comprehensive understanding of the modeling strategies required for the fuel decarbonization of industrial gas turbines. The first step will be to assimilate the chemical kinetics involved in the combustion process, thorugh the use of the CANTERA suite. Next, a progression toward more realistic configurations will be anticipated by the study of a 2D bunsen flame which will be carried out using the LES code AVBP. Finally, the performance of the current turbulent combustion modeling implemented in AVBP will be assessed in a downsized gas turbine burner. Furthermore, the simulations will be evaluated againts existing numerical data.

DESIRED PROFILE

Background required:

Numerical simulation | Fluid dynamics | Programming in Python
Programming in Fortran | Languages: French and English | Reactive Flows

Abilities:

Capacity for analysis and synthesis | Innovation capacity | Ability to work independently
Relational qualities | Rigorous

PLEASE SEND CV + COVER LETTER